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FORAGE BASE AND MEGAFAUNA RESTORATION IN THE "KRASNY BOR" NATURE RESERVE

Forage base is a key concept in the matter of specific and numeric composition reconstruction of large herbivores. In researches the forage base of "Krasny Bor" nature reserve was estimated. Now there is a restoration of red deer and bison species there. The assessment of forage amount indicated their rather small quantity, in particular concerning woody forages. Comparison of the established forage reserve with their potential amount of intake by the large herbivorous testifies that forage reserves in the course of hoofed animals activity will steadily decrease. Low forage efficiency of nature reserve forests first of all is defined by features of the studied forest ecosystems located in a subzone of the South Taiga. In the future for highly productive heterogeneous forest ecosystems reconstruction it will be necessary to recreate all food chains, including restoration of grazing chains by introduction of grazing species of large herbivores.

Key words: forage base, ecosystem, woody forage, megafauna, herbivorous.

Introduction. Due to Ltd. "Interservice" the population of red deer and bison is created on the territory of "Krasny bor" reserve. In prospect, creation of population of wild fallow deer is planned. Thus, evaluation of forage base of the territory is an actual issue. Most of the territory of "Krasny bor" reserve is occupied by forests. Duration of snow cover and snow cover depth are the main negative factors for large herbivorous population. These indicators represent the maximum within the territory of Belarus. In this regard dietary exposure of large herbivorous should consists of woody forage however it can leads to some influence on phytocoenosis and succession [1].

Main part. Exploring of forage base of the territory was carried out on transects installed by nets with the center in "Ardavskije" stow, the place of bison and red deer inhabitation. In total 62 nets are installed on the area. On these transects quantity of fodder species stick, its damageability, structure and projective cover of plants of ground cover was recorded. In total 959 of sticks of regrowth and understory was studied.

Most prevalent plants on the "Krasny bor" territory are buckthorn (27.4%), mountain ash (21%), birch (27.4%) and fir (32.3%). All the plants are damaged by huge phytophagan. Most preferable plants in terms of fodder such as buckthorn, mountain ash and bird cherry are highly damaged (more than 90%). Mountain ash almost on each transects is in extremely damaged condition.

Forests of the considered area have a typical look of South Taiga [2]. They are characterized by the maximum saturation of the understory of boreal species. Here prevail pine lichen scrub forests and pine scrub mosses forests. Average woody forage amount for these forests is 2,940 kg/thous. ha, where 59.6% (1,753 kg/ha) is juniper. Foliate fodder represent 977 kg/ha (33.2%) but they are mostly represented by badly eaten birch (893 kg/thous. ha). An average reserve of fodder heather stem in pine lichen scrub forests is equal to 111,500 kg/thous. ha.

Pine moss suffruticosa forests of South Taiga type participate in fir regrowth and tree stratum. The existence of these tree species significantly reduces quantitative and qualitative participation of fodder species in lower canopy. Such forests are characterized by low fodder reserve. In forests prevail fir (653 kg/thous. ha, 50.5%), which is almost not eaten by hoofed animals. Foliate fodder reserves in average do not exceed 283 kg/thous. ha. At the same time 98 kg/thous. ha (35%) are birch trees. It is worth mentioning that in such pine forests juniper forms a significant part of fodder – 321 kg/thous. ha (24.8%). Here the largest fodder reserves of bush stems are created. Fodder reserves consisting of blueberry are equal to 123,227 kg/thous. ha and heather – 25,818 kg/thous.ha.

More reserves of foliate fodder have pine bushy herbasious sedge-sphagnum forests combined with bushy haircap moss forests on transition and lowland swamps – 2,000 kg/thous. ha. Of them, near 20% is birch and others are bush willows. However such forests are more preferable for elk then for red deer or bison. Moreover fir groove has the lowest woody forage. Explored territory is mostly represented by fir bushy moss forests, which have typical South Taiga features. The understory is poorly developed. It is mainly represented by fir, which is not almost eaten by hoofed animals. Foliate fodder reserves are up to 573 kg/thous. ha. Bushes fodder reserves are also low, up to 18,000 kg/thous. ha. of blueberry stem. Birch forest and sticky alder forest poses big reserve of woody forage. Birch forests are presented by small number of warty birch forests. These

warty birch forests coupled with bushy moss and warty birch nettle forests with fern forest grass. Warty birch pleurocarpous moss forests with pleurocarpous moss fruticulose forests haven't got lots of woody forage especially broadleaved species. An average reserve of broadleaved species is 267 kg/thous. ha. This is due mostly to the large number of fir regrowth which limits broadleaved species fodder existence. For the same reason small amount of blueberry stem is not more than 24,000 kg/thous. ha.

Broadleaves fodder reserves in young growth warty birch nettle forests together with grass fern forests is equal to 7,445 kg/thous. ha, with the number of birch in it no more than 1.5%. Fodder reserves as a bush stem from the forest live cover is up to 72,333 kg/thous. ha. Indigenous birch forests are mainly presented by furry birch sedge grass sphagnum forests together with marsh on transition swamps. Such types of forests are much edged with a weak level of flowage. They are specific for transition swamps and raised bogs. Such forests usually are avoided by red deer and bison but they are attended by elk. Main fodder reserves here are represented by pine (12,058 kg/thous. ha). Foliate fodder reserves are quite high and are equal not less than 1,900 kg/thous. ha. European alder forests are largely grown in the indigenous forests and young growth forests. Young growth European alder forests are presented by nettle forests with ground elder sorrel forests. These forests are quite rich. They have high reserves of woody forage of broad leaved species that are equal to 21,080 kg/thous. ha. Also these forests are inhabitation for reintroduced bison. Indigenous European alder forests are mostly presented by European alders and furry sticky alder goats-beard forests with mixed herbs forests on lowland swamps. Woody forage of broad leaved species is not typical for these forests (305 kg/thous. ha). Moreover they are characterized by dense fir regrowth.

Fodder reserves in pine forests need a particular attention. Absolute majority of pine young forests are presented by homogeneous stands. The main part in reserve formation here plays pine (265,263 kg/thous. ha). Broad leaved fodder in general is presented by birch. Thus, forests of studied nature reserve is presented by typical South Taiga forest types with low broad leaved fodder reserve and dense fir regrowth existence which is almost not eaten by hoofed animals. On average woody fodder reserves of leaved species are 2,043 kg/thous. ha, birch – 478 kg/thous. ha, pine – 19,864 kg/thous. ha, fir – 3,452 kg/thous. ha, juniper – 199 kg/thous. ha. Forest live cover fodder is presented by blueberry stem – 61,734 kg/thous. ha, heather stem – 40,480 kg/thous. ha.

In order to evaluate potential capacity of rangelands and to conduct analysis we carried out a calculation of consumption of vegetation fodder by phytophagous insects on studied territory (Table) [5]. Population density data are taken from spring field researches.

Thus, the total biomass of fodder consumed by megafauna species (except for beavers) will constitute not less 320–330 tons per year per 1 thous. ha. Winter time is unfavorable period for fodder supply. Consumption amount will constitute 100–110 tons per 1 thous. ha. As it can be seen from the figure, even under the condition of complete recycling of woody forage, the quality of existing fodder is lower in 2 times than it is required for current biomass amount of hooved animals.

At the same time significant fodder stockpiles include conifer plants (93.2% from the general amount of woody forage) that are not preferable for most species (red deer, bison and roe deer) and are consumed just in case of shortage of other fodder. Almost 90% of fodder reserves that are presented by pine trees in planted forests, i. e. by origin are artificial. Birch isn't also preferable among hoofed animals (31.3%). Thus fodder productivity of understory is extremely low and it can't be the main food source of large herbivorous like red deer and bison. Blueberry and heather stems are more stable source of fodder for this species (Figure).

Calculation of phytomass consumption (by large herbivorous)

Animal species	Population density, animal./thous. ha	Consumption of vegetative fodder, kg			
		Vegetative season		Winter season	
		1 animal per day	1 thous. ha per season	1 animal per day	1 thous. ha per season
Red deer	17.9	12	45,087	10	26,835
Elk	26.4	25	138,369	17	67,215
European roe deer	0.1	4.5	84	2.5	30
Boar	5.0	5	5,250	2.5	1,875
Bison	5.0	30	31,500	15	11,250
Total	–	–	220,290	–	107,205

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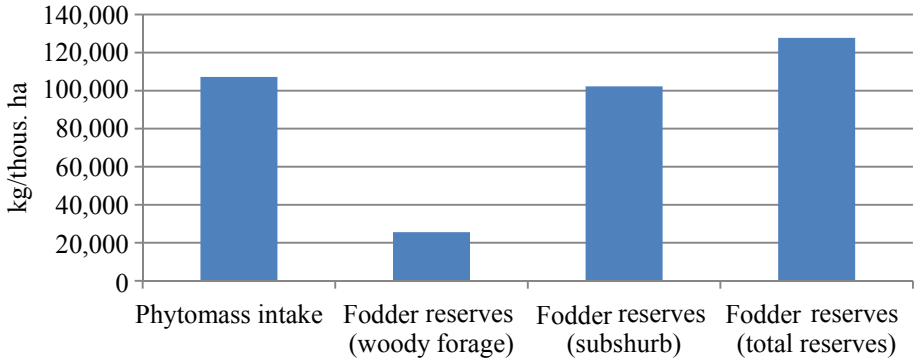

Comparison of actual fodder reserves and theoretical amount of retained phytomass consumed by herbivorous

It is obvious that with the existing grazing pressure amount of woody forage will decline steadily. Such species as bison, red deer in winter time will have to pass to ground cover fodder or to artificial fodder. At the same time high grazing pressure on forest phytocoenosis will lead to their restructure, namely, to plant extinction and to tree stratum restructuring.

Conclusion. Thus, according to recent researches of forest ecosystem productivity as possible grazing areas it becomes obvious that for wild hoofed animals forage base of the territory is not high. Forests that are presented by South Taiga types of trees have low forage base, especially what concerns woody forage. That can be a reason for problems with fodder for hoofed animals in crucial years when snow cover is long lasting. Well-being of such animals as bison, red deer and roe deer will be determined by the fodder from the forest live cover. It seemed that in the circumstances there can't be high quantity and species diversity of large herbivores. However, according to paleontological and archeological excavations, it has been found out that starting with the late Pleistocene and till the Holocene these territories were inhabited by different phytophagan species. Moreover fauna was mixed [3, 4]. There were forest species (elk, deer), steppe species (saiga antelope) and north (reindeer). It follows that in those time ecosystems were able to support numerous herds of large phytophagans despite of harsh climate. Ecosystems that consisted of different types of vegetation and hadn't zonal distribution are considered to be climax [4]. They include various species from different types of trophic groups that are combined with generations of all edificatory types of the region. For Eastern Europe types of edificators include dark conifer and broad-leafed trees, large herd hoofed animals (bison, tarpan, Caucasian tur, beaver and others). Only a complete range of edificator types ensure the sustainable existence of both shade-requiring and light-requiring flora and fauna in spontaneously developing live cover. Active economic influence on ecosystems made them loan. Thus, it is necessary to restore climax ecosystems that include population mosaics of different plant and animal species. It is possible to make only by restoring of all types of edificators, which will be able to create and maintain population mosaic.

Now on the territory of "Krasny bor" reserve, such species as bison and red deer were restored. However, these species combined with existing (elk, roe deer) can't restore meso- and macro-mosaic in phytocoenosis. Also it is essential to restore such grazing species as horse and tur.

Thus, the replacement of pine by birch in young pine forest is well noted. Low proportion of broad leaved woody forage and high population density of elk leads to almost whole utilization of young pine forest at selected areas.

The results of such influence on forest phytocoenosis have a dual role. From the forestry management point of view, there is damage to forest vegetation and as a result to the whole forestry. However from the landscape mosaics point of view, that has biodiversity, such an effect is quite favorable. As a result of pine young growth destruction, zoogene meadows and thinned deciduous forest stands are created, where photophilous flora and fauna is developing under the forest canopy. That definitely increases an ecotone of landscapes and as a result the quantities of biological species, as species that are typical for forest biocenosis as well as for open biocenosis occur in the area.

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